

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application.

Listing of Claims:

1. (Currently Amended) A method ~~for providing an automatic initial load of~~ loading data to ~~into a new table copy, concurrently both with user changes to a source table copy to the new table copy and with active replication to existing table copies in an asynchronous~~ the new table copy to be added to a database replication group including a plurality of pre-existing table copies, the method comprising:

loading data from a source table copy into the new table copy, the source table copy being one of the plurality of pre-existing table copies in the database replication group;

concurrent to the loading of the data into the new table copy,

simultaneously applying changes of a user application received during the loading of the data to the plurality of pre-existing table copies in the database replication group including the source table copy; and

(a) creating a spill storage area at the new table copy and storing the changes of the user application in the storage spill area without applying the changes of the user application to the new table copy; and

~~(b) loading the data from the source table copy to the new table copy, wherein changes are applied to the active table copies during the loading, wherein changes to the new table copy are stored in spill storage area during the loading; and~~

(e) upon completion of the loading of the data into the new table copy, applying the changes stored in the spill storage area to the new table copy after the loading of the data is done.

2. (Currently Amended) The method of claim 1, wherein prior to ~~the creating (a)~~ creating a

spill storage area at the new table copy, the method comprises:

(a1) seeing a start signal at the source table copy;

(a2) sending a schema message from the source table copy to the new table copy, the schema message indicating that changes are being captured from the source table copy for a subscription of the new table copy; and

(a3) changing a state ~~for a new table copy of the~~ subscription of the new table copy at the source table copy from “inactive” to “loading”.

3. (Currently Amended) The method of claim 1, wherein ~~the creating (a)~~ creating a spill storage area at the new table copy comprises:

(a1) receiving a the schema message at the new table copy; and

(a2) invoking a load utility at the new table copy to load the data from the source table copy into the new table copy, if the data load is an internal data load; and

~~(a3) creating the spill storage area.~~

4. (Currently Amended) The method of claim 3, wherein ~~the creating (a)~~ creating a spill storage area at the new table copy further comprises:

(a4) changing a state of a ~~new table copy~~ subscription of the new table copy at the new table copy from “inactive” to “internal loading” if the data load is an internal data load, an internal data load being a data load automatically activated by the load utility; and or

(a5) changing the state of the ~~new table copy~~ subscription of the new table copy at the new table copy from “inactive” to “external loading” if the data load is an external data load, an external data load being a data load manually activated by an administrator.

5. (Currently Amended) The method of claim 1, wherein ~~the loading (b)~~ loading data from a source table copy into the new table copy comprises:

(b1) ~~loading~~ copying the data from the source table copy to the new table copy; and

(b2) ~~applying the changes for the active table copies to the active table copies during the data load;~~

(b3) ~~storing the changes for the new table copy in the spill storage area during the data load; and~~

(b4) sending a load done message from the new table copy to the source table copy after the data load is done, ~~if the data load is an internal load.~~

6. (Currently Amended) The method of claim 5, wherein ~~the loading (b)~~ loading data from a source table copy into the new table copy further comprises:

(b5) receiving the load done message at the source table copy;

(b6) sending the load done message back to the new table copy; and

(b7) changing the a state of ~~a new table copy~~ the subscription of the new table copy at the source table copy from “loading” to “active”.

7. (Currently Amended) The method of claim 6, wherein ~~the loading (b)~~ loading data from a source table copy into the new table copy further comprises:

(b8) tagging the changes of the user application for the new table copy that occur before the load done message is received at the source table copy.

8. (Currently Amended) The method of claim 1, wherein ~~the applying (e)~~ applying the changes of the user application stored in the spill storage area to the new table copy comprises:

- (e1) receiving a the load done message at the new table copy;
- (e2) starting a spill agent thread at the new table copy;
- (e3) changing a the state of ~~a new table copy~~ the subscription of the new table copy at the new table copy to “load finishing”; and
- (e4) the spill tread agent processing the changes of the user application stored in the spill storage area. ~~at least one spill queue by the spill agent thread.~~

9. (Original) The method of claim 8, wherein for an internal data load, a thread used to load the data is reused as the spill agent thread.

10. (Currently Amended) The method of claim 8, wherein ~~the processing (e4)~~ the spill tread agent processing the changes of the user application stored in the spill storage area comprises:

- (e4i) re-executing the changes of the user application to a same row at the new table copy in a same order as previously executed at the source table copy;
- (e4ii) identifying and resolving dependencies between the changes of the user application to the same row; and
- (e4iii) detecting and resolving conflicts between the changes of the user application to the same row.

11. (Currently Amended) The method of claim 10, wherein ~~the re-executing (e4i)~~ re-executing the changes of the user application to a same row at the new table copy comprises:

- (e4iA) deleting ~~the~~ each re-executed change from the spill storage area in a same transaction as the re-execution the change.

12. (Currently Amended) The method of claim 11, wherein ~~the deleting (e4iA)~~ the deletion of each re-executed change is performed with a two-phase commit protocol.

13. (Currently Amended) The method of claim 11, wherein ~~the deleting (d4iA)~~ deleting each re-executed change comprises:

(e4iA(I)) storing a message identifier for the re-executed change at the new table copy, wherein upon a restart of the ~~data load at~~ loading of the data into the new table copy in response to a shutdown or crash, only changes from the spill storage area without a corresponding stored message identifier are applied to the new table copy.

14. (Currently Amended) The method of claim 10, wherein ~~the detecting and resolving (d4iii)~~ detecting and resolving conflicts comprises:

(e4iiiA) ignoring a change to a row not found in the new table copy when re-executing a conflicting row delete;

(e4iiiB) ignoring a change to a row not found in the new table copy when re-executing a conflicting row update;

(e4iiiC) ignoring a change to a row in the new table copy when re-executing a conflicting row insert; and

(e4iiiD) ignoring a change to an old row not found or a new row found in the new table copy when re-executing a conflicting key update.

15. (Currently Amended) The method of claim 10, wherein ~~the detecting and resolving (e4iii)~~ detecting and resolving conflicts comprises:

(e4iiiA) ignoring a missing row in the new table copy when re-executing a row delete;

(e4iiiB) transforming a re-execution of an update into a row insert when a row in the new table copy is missing; and

(e4iiiC) transforming a re-execution of an insert into an update when a row in the new table copy already exists.

16. (Currently Amended) The method of claim 36, wherein ~~the removing~~ (d) removing the spill storage area from the new table copy comprises:

(d1) the spill agent thread sending a spill queue empty message ~~by a spill agent thread at the new table copy to a browser thread at the new table copy~~ when the spill agent thread reaches a last change ~~in~~ on the spill storage area;

(d2) the browser thread determining ~~by a browser thread at the new table copy~~ that an oldest running transaction at the new table copy is older than a most recent transaction when a load done message was received at the source table copy;

(d3) the browser thread sending a spill final message ~~from the browser thread~~ to the spill agent thread; and

(d4) responsive to the spill agent thread receiving the spill final message, deleting the spill storage area when emptied by the spill agent thread.

17. (Currently Amended) The method of claim 16, wherein ~~the removing~~ (d) removing the spill storage area from the new table copy further comprises:

(d5) the spill agent thread sending a spill done message ~~by the spill agent thread~~ to the browser thread;

(d6) terminating the spill agent thread;

(d7) the browser thread receiving the spill done message ~~by the browser thread~~; and

~~(d8)~~ changing a the state of a new table copy the subscription of the new table copy at the new table copy to “active”.

18. (Currently Amended) A computer readable medium with program instructions, tangibly stored thereon, for ~~providing an automatic initial load of~~ loading data to into a new table copy, ~~concurrently both with user changes to a source table copy to the new table copy and with active replication to existing table copies in an asynchronous~~ the new table copy to be added to a database replication group including a plurality of pre-existing table copies, the computer readable medium comprising instructions for:

loading data from a source table copy into the new table copy, the source table copy being one of the plurality of pre-existing table copies in the database replication group;

concurrent to the loading of the data into the new table copy,

simultaneously applying changes of a user application received during the loading of the data to the plurality of pre-existing table copies in the database replication group including the source table copy; and

~~(a)~~ creating a spill storage area at the new table copy and storing the changes of the user application in the storage spill area without applying the changes of the user application to the new table copy; and

~~(b)~~ loading the data from the source table copy to the new table copy, wherein changes are applied to the active table copies during the loading, wherein changes to the new table copy are stored in spill storage area during the loading; and

~~(c)~~ upon completion of the loading of the data into the new table copy, applying the changes stored in the spill storage area to the new table copy after the loading of the data is done.

19. (Currently Amended) The computer readable medium of claim 18, wherein prior to the ~~creating (a)~~ instructions for creating a spill storage area, the computer readable medium comprises instructions for:

(a1) seeing a start signal at the source table copy;

(a2) sending a schema message from the source table copy to the new table copy, the schema message indicating that changes are being captured from the source table copy for a subscription of the new table copy; and

(a3) changing a state ~~for a new table copy~~ of the subscription of the new table copy at the source table copy from “inactive” to “loading”.

20. (Currently Amended) The computer readable medium of claim 18, wherein ~~creating (a)~~ instructions for creating a spill storage area at the new table copy comprises instructions for:

(a1) receiving a the schema message at the new table copy; and

(a2) invoking a load utility at the new table copy to load the data from the source table copy into the new table copy, ~~if the data load is an internal data load~~; and

(a3) ~~creating the spill storage area.~~

21. (Currently Amended) The computer readable medium of claim 20, wherein the ~~creating~~ ~~(a)~~ instructions for creating a spill storage area at the new table copy further comprises instructions for:

(a4) changing a state of a ~~new table copy~~ subscription of the new table copy at the new table copy from “inactive” to “internal loading” if the data load is an internal data load, an internal data load being a data load automatically activated by the load utility; ~~and or~~

(a5) changing the state of the ~~new table copy~~ subscription of the new table copy at the

new table copy from “inactive” to “external loading” if the data load is an external data load, an external data load being a data load manually activated by an administrator.

22. (Currently Amended) The computer readable medium of claim 18, wherein the ~~loading~~ (b) instructions for loading data from a source table copy into the new table copy comprises instructions for:

(b1) ~~loading~~ copying the data from the source table copy to the new table copy; and

~~(b2) applying the changes for the active table copies to the active table copies during the data load;~~

~~(b3) storing the changes for the new table copy in the spill storage area during the data load; and~~

(b4) sending a load done message from the new table copy to the source table copy after the data load is done, ~~if the data load is an internal load.~~

23. (Currently Amended) The computer readable medium of claim 22, wherein the ~~loading~~ (b) instructions for loading data from a source table copy into the new table copy further comprises instructions for:

~~(b5)~~ receiving the load done message at the source table copy;

~~(b6)~~ sending the load done message back to the new table copy; and

~~(b7)~~ changing the a state of ~~a new table copy~~ the subscription of the new table copy at the source table copy from “loading” to “active”.

24. (Currently Amended) The computer readable medium of claim 23, wherein the ~~loading~~ (b) instructions for loading data from a source table copy into the new table copy further

comprises instructions for:

(b8) tagging the changes of the user application for the new table copy that occur before the load done message is received at the source table copy.

25. (Currently Amended) The computer readable medium of claim 18, wherein the ~~applying~~ (e) instructions for applying the changes of the user application stored in the spill storage area to the new table copy comprises instructions for:

(e1) receiving a the load done message at the new table copy;

(e2) starting a spill agent thread at the new table copy;

(e3) changing a the state of a ~~new table copy~~ the subscription of the new table copy at the new table copy to “load finishing”; and

(e4) the spill tread agent processing the changes of the user application stored in the spill storage area. ~~at least one spill queue by the spill agent thread.~~

26. (Currently Amended) The computer readable medium of claim 25, wherein for an internal data load, a thread used to load the data is reused as the spill agent thread.

27. (Currently Amended) The computer readable medium of claim 25, wherein the ~~processing (e4)~~ instructions for the spill tread agent processing the changes of the user application stored in the spill storage area comprises instructions for:

(e4i) re-executing the changes of the user application to a same row at the new table copy in a same order as previously executed at the source table copy;

(e4ii) identifying and resolving dependencies between the changes of the user application to the same row; and

~~(e4iii)~~ detecting and resolving conflicts between the changes of the user application to the same row.

28. (Currently Amended) The computer readable medium of claim 27, wherein the ~~re-executing (e4i)~~ instructions for re-executing the changes of the user application to a same row at the new table copy comprises instructions for:

(c4iA) deleting the re-executed change from the spill storage area in a same transaction as the re-execution.

29. (Currently Amended) The computer readable medium of claim 28, wherein ~~deleting (d4iA)~~ instructions for deleting each re-executed change comprises instructions for:

~~is performed with~~ performing the deletion of each re-executed change using a two-phase commit protocol.

30. (Currently Amended) The computer readable medium of claim 28, wherein ~~deleting (deiA)~~ instructions for deleting each re-executed change comprises instructions for:

~~(e4iA(I))~~ storing a message identifier for the re-executed change at the new table copy, wherein upon a restart of the ~~data load at~~ loading of the data into the new table copy in response to a shutdown or crash, only changes from the spill storage area without a corresponding stored message identifier are applied to the new table copy.

31. (Currently Amended) The computer readable medium of claim 27, wherein the ~~detecting and resolving (dei)~~ instructions for detecting and resolving conflicts comprises instructions for:

~~(e4iiiA)~~ ignoring a change to a row not found in the new table copy when re-executing a

conflicting row delete;

(~~e4iiiB~~) ignoring a change to a row not found in the new table copy when re-executing a conflicting row update;

(~~e4iiiC~~) ignoring a change to a row in the new table copy when re-executing a conflicting row insert; and

(~~e4iiiD~~) ignoring a change to an old row not found or a new row found in the new table copy when re-executing a conflicting key update.

32. (Currently Amended) The computer readable medium of claim 27, wherein the ~~detecting and resolving~~ (~~e4iii~~) instructions for detecting and resolving conflicts comprises instructions for:

(~~e4iiiA~~) ignoring a missing row in the new table copy when re-executing a row delete;

(~~e4iiiB~~) transforming a re-execution of an update into a row insert when a row in the new table copy is missing; and

(~~e4iiiC~~) transforming a re-execution of an insert into an update when a row in the new table copy already exists.

33. (Currently Amended) The computer readable medium of claim 37, wherein the ~~removing~~ (~~d~~) instructions for removing the spill storage area from the new table copy comprises instructions for:

(~~d1~~) the spill agent thread sending a spill queue empty message ~~by a spill agent thread at the new table copy to a browser thread at the new table copy~~ when the spill agent thread reaches a last change in ~~on~~ the spill storage area;

(~~d2~~) the browser thread determining ~~by a browser thread at the new table copy~~ that an oldest running transaction at the new table copy is older than a most recent transaction when a

load done message was received at the source table copy;

(d3) the browser thread sending a spill final message ~~from the browser thread~~ to the spill agent thread; and

(d4) responsive to the spill agent thread receiving the spill final message, deleting the spill storage area when emptied by the spill agent thread.

34. (Currently Amended) The computer readable medium of claim 33, wherein the ~~removing~~

~~(d)~~ instructions for removing the spill storage area from the new table copy further comprises instructions for:

(d5) the spill agent thread sending a spill done message ~~by the spill agent thread~~ to the browser thread;

(d6) terminating the spill agent thread;

(d7) the browser thread receiving the spill done message ~~by the browser thread~~; and

(d8) changing a the state of ~~a new table copy~~ the subscription of the new table copy at the new table copy to “active”.

35. (Currently Amended) A system comprising:

~~at least one active table copy in an asynchronous database replication group, wherein the~~
~~at least one active table copy comprises a source table copy~~ including a plurality of pre-existing
table copies;

a new table copy to be added to the asynchronous database replication group; and

a load utility to load data from a source table copy into the new table copy, the source
table copy being one of the plurality of pre-existing table copies in the asynchronous database
replication group;

concurrent to the load utility loading the data from the source table copy into the new table copy, an apply module to

simultaneously apply changes of a user application received during the loading of the data to the plurality of pre-existing table copies in the replication group including the source table copy; and

create a spill storage area at the new table copy and store the changes of the user application in the storage spill area without applying the changes of the user application to the new table copy; and

upon completion of the loading of the data into the new table copy, the apply module to

apply the changes of the user application stored in the spill storage area to the new table copy; and

remove the spill storage area from the new table copy after the changes stored in the spill storage area have been applied to the new table copy.

~~a spill storage area at the new table copy,~~

~~wherein the spill storage area is created after the data load is initiated,~~

~~wherein the data is loaded from the source table copy to the new table copy,~~

~~wherein changes are applied to the at least one active table copy during the loading of the data,~~

~~wherein changes for the new table copy are stored in the spill storage area during the loading of the data, and~~

~~wherein the changes in the spill storage area are applied to the new table copy after the loading of the data is done.~~

36. (Currently Amended) The method of claim 1, further comprising:

(d) removing the spill storage area from the new table copy after the changes stored in the spill storage area have been applied to the new table copy.

37. (Currently Amended) The ~~method~~ computer readable medium of claim 18, further comprising instructions for:

(d) removing the spill storage area from the new table copy after the changes stored in the spill storage area have been applied to the new table copy.